The James Bond Project Report

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In this project, you can find a Dynamic Programming solution to the word break problem.

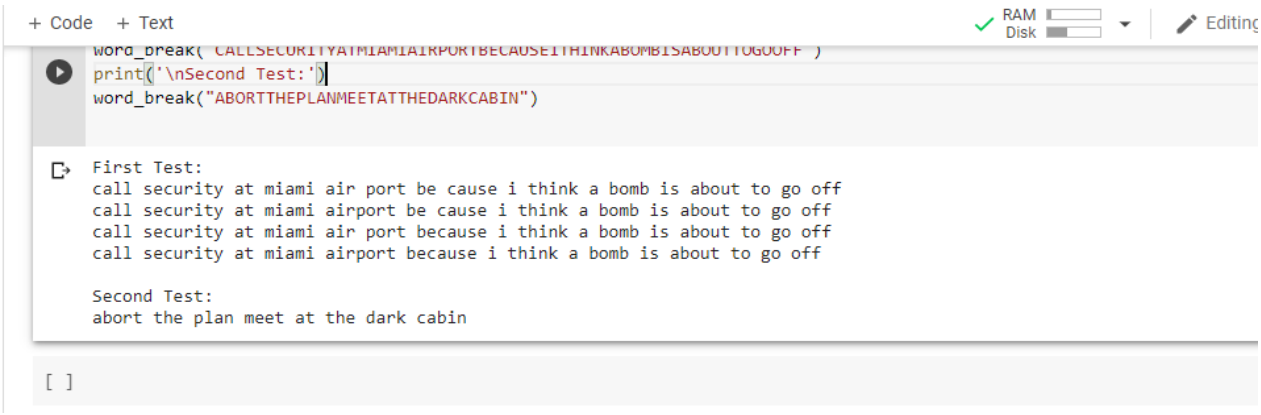
Given a non-empty string *s* and a dictionary containing a list of non-empty words, we add spaces in *s* to construct a sentence where each word is a valid word in dictionary and then return all such possible sentences. Basically, when we get the input, we try to get the last word in the input that exists in the dictionary, and keep repeating that step for the rest of the input.

The first loop in the *word_break* is for traversing the string, the second loop is for splitting the string of *[0, i)*, and then judge whether the two parts *[0: j)* and *[j : i)* are in the dictionary. Valid in the middle, the previous part has been calculated, directly in the *dp* search, the latter part is found in the dictionary, because as long as a feasible cut decomposition is found, so break in time.

The *helper* function uses the DFS method to find out all the paths, from *dp[-1]* constantly looks forward, the last three lines in this function is very classic which are used frequently in the backtracking method and in DFS.

The worst-case time complexity of this algorithm is O(2^n), *n* being the number of characters in the input. In the worst case, each character in the input would be a word in the dictionary. That would make the total items in each list 2^n. The dictionary of words is stored in the *set* data structure of python which is implemented as a hash table. So, we can expect to lookup/insert/delete in O(1) on average.

The two sample sentences given in the project definition are given as input to the algorithm and you can see the resulting output image below.


+ Code
+ Text
RAM
Disk
Editing
word_break(CALLSECURITYATMIAMIAIRPORTBECAUSEITHINKABOMBISABOUTTOGOOFF)
print('\nSecond Test:')
word_break("ABORTTHEPLANMEETATTHEDARKCABIN")
First Test:
call security at miami air port be cause i think a bomb is about to go off
call security at miami airport be cause i think a bomb is about to go off
call security at miami air port because i think a bomb is about to go off
call security at miami airport because i think a bomb is about to go off
Second Test:
abort the plan meet at the dark cabin
[ ]